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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/975,855	10/11/2001	Ren-Guey Hsieh	67,200-447	9473

7590 10/10/2003

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EXAMINER

MOHAMEDULLA, SALEHA R

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 10/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicati n No.

09/975,855

Applicant(s)

HSIEH, REN-GUEY

Examiner

Saleha R. Mohamedulla

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 October 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 9-15 is/are rejected.
- 7) ☒ Claim(s) 7,8,16 and 17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 October 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claims 1-17 are pending.

Drawings

1. The transmittal form filed 10/11/01 states that 3 formal drawings were submitted showing Figures 1-6B. However, only 2 sheets of formal drawings were submitted. These sheets show Figures 1-6B.
2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 18 on page 14. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities: on page 14, in paragraph 37, the description states "14b and 14b." It appears the phrase is redundant.

Appropriate correction is required.

Claim Objections

4. Claims 2 and 12 are objected to because of the following informalities: in line 3 of both claims, "photoresist" should be "resist." Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 10 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. Claim 10 recites the limitation "the blanket target layer" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-4, 6, 9-13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over US# 5,667,923 to Kanata in view of US# 6,180,289 to Hirayanagi.

10. Kanata teaches that a resist film is formed on a silicon substrate and a charged particle beam exposure is performed thereon (col. 1, lines 19-21). Kanata teaches the exposure pattern will have a parasitic pattern formed due to scattering and that this scattering causes proximity effect (col. 1, lines 27-40). Kanata teaches using electron beam as the charged particle beam (col. 1, lines 40-45). Kanata also teaches substrates used in semiconductor processing (col. 4, lines 4-5). The substrates are coated with various thin-layers such as silicon dioxide and silicon

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nitride, which are dielectric materials, and aluminum, titanium and tungsten, which are metal materials. Kanata also teaches exposing a resist layer on a substrate formed of various thin layers (col. 4, lines 5-10). Figs. 8A – 10B show selective exposure on a resist film 54 covering a lower level tungsten 52 and an upper level layer 53 (col. 4, lines 25-30). Charged particle beam is irradiated on the resist film according to data of upper level patterns to expose the resist film (col. 4, lines 30-32). Fig. 9B shows the latent image formed in the resist 54. The latent pattern is contiguous as it is formed in one resist layer. Then, the resist film is developed to form the resist pattern and the upper level layer is etched using the developed resist film as a mask (col. 4, lines 32-35). Figs. 10A and 10B show the resultant structure. The exposed portions of the resist remain on the substrate after development and the pattern of the exposed portions is transferred to the underlying layers shown in Figs. 9B and 10B. Thus, the resist is a negative resist.

Therefore, Kanata teaches providing a substrate, forming over the substrate a blanket target or blanket masking layer, that is, the lower level and/or upper level layer, forming a blanket negative resist layer over the target or masking layer, exposing, while employing a charged particle beam method susceptible to a proximity effect, the resist layer to form a contiguous latent pattern, developing the resist layer to form a patterned resist layer, employing the patterned resist layer as a mask for forming from the blanket target or masking layer a patterned target or masking layer. The substrate can be used in integrated circuit microelectronic fabrications, as the substrate is used in semiconductor processing. The upper and lower level layers can be microelectronic dielectric, such as silicon dioxide or silicon nitride, or microelectronic conductor, such as tungsten, titanium or aluminum, materials.

Kanata does not teach that the charged beam method employs when forming the latent pattern a series of adjacent fractured pattern elements, where an adjacent pair of pattern elements is separated by a gap.

Hirayanagi teaches a projection microlithography mask for charged particle beam lithography (col. 1, lines 10-20). The mask comprises a pattern defined on a plurality of thin mask reticles. The plurality of mask reticles is secured to a single mask reticle retention member (col. 3, lines 1-5). The mask reticle patterns are divided into multiple mask subfields. Each mask subfield comprises a respective portion of the overall pattern to be transferred from the mask to the substrate (col. 3, lines 5-7). Therefore, Hirayanagi teaches that the method employs when exposing a resist layer a series of adjacent fractured pattern elements separated by a gap, that is, the gap formed by the retention member (Fig. 1c; col. 2, lines 5-10). Hirayanagi also teaches alignment marks on the mask reticles and on the retention member (col. 3, lines 7-10). The alignment marks facilitate alignment of the mask and correction of pattern-image errors resulting from mechanically or thermally induced distortion of the mask reticles (col. 3, lines 9-12). Therefore, Hirayanagi teaches that by providing the fractured pattern elements and mask, the sensitive substrate, or resist layer, is formed with enhanced pattern fidelity and critical dimension control, because correct alignment and correction of pattern errors produce enhanced pattern fidelity and critical dimension control.

The references are analogous art as they are drawn to charged particle beam methods. It would have been obvious to one of ordinary skill in the art to use the mask of Hirayanagi in the method of Kanata, as the mask of Hirayanagi can be employed without direct writing which allows for relatively high wafer throughput and decreased costs (Hirayanagi; col. 2, lines 45-50).

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One of ordinary skill in the art would have a reasonable expectation of success in using the mask of Hirayanagi as Kanata teaches that the charged particle beam method is performed with a mask (Kanata; col. 3, lines 20-22).

11. Claims 5 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US# 5,667,923 to Kanata in view of US# 6,180,289 to Hirayanagi, as applied to claims 1 and 11 above, in further view of US# 5,629,772 to Ausschnitt.

12. Kanata in view of Hirayanagi teaches the limitations discussed above in paragraph 10. Kanata in view of Hirayanagi teaches a negative resist, but does not teach a positive resist.

Ausschnitt teaches a lithographic process using a mask where a latent image is formed in a photoresist layer (col. 1, lines 15-20). Ausschnitt teaches that the latent image marks the volume of the photoresist material that either is removed during the development process in the case of a positive resist or remains after development in the case of a negative resist (col. 1, lines 25-30).

The references are analogous art as they are drawn to lithographic exposure processes of photosensitive substrates. It would have been obvious to one of ordinary skill in the art to use a positive resist instead of a negative resist as Ausschnitt teaches that it is common in the art to use both negative and positive resists in lithographic exposure processes.

Allowable Subject Matter


13. Claims 7, 8, 16 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base

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claim and any intervening claims. The prior art does not teach or suggest the recited gap widths or lengths. Hirayanagi teaches that the retention member, which forms a gap between patterns, is 3 mm thick and 15mm or 20mm square (col. 7, lines 40-55). Hirayanagi also teaches a 1/8 demagnification ratio for exposure (col. 5, line 60). There is no motivation in the prior art to form the gap dimensions to be as small as the dimensions recited in the present claims.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Saleha Mohamedulla whose telephone number is (703) 308-1260. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Mark Huff, can be reached on (703) 308-2464. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9310. The After Final fax phone number is (703) 872-9311. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.


Saleha R. Mohamedulla
Patent Examiner
Technology Center 1700
September 30, 2003